

U.S. Application 09/619,560

Attorney Docket No. 2000B047

REMARKS**Status of the Claims**

Claims 1, 3 to 14, and 16 to 24 presently stand rejected in this application.

Applicants have herein added claims 27 and 28.

Applicants respectfully request entry of this Amendment and reconsideration of this application, as amended.

Claims 1, 3 to 14, 16 to 24, 27, and 28 are presently pending in this application, claims 1, 10, and 19 being independent.

Rejection Under 35 USC § 103(a)

Claims 1, 3 to 14, and 16 to 22 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kaufman (U.S. Patent No. 3,385,906) in view of Cheng et al (U.S. Patent No. 5,557,024). In particular, the Examiner argues that Kaufman teaches reaction of benzene with propylene in the presence of an alkylation catalyst to produce cumene-containing product from which is separated a majority of cumene. The remaining effluent is combined with benzene and transalkylated over a catalyst such as zeolite Y. Acknowledging that Kaufman fails to disclose the presently claimed process using a mixture of two different molecular sieves, claim 6's co-extrusion step, or the alkylation catalyst of claim 14, the Examiner relies on the Cheng reference for its disclosure of the use of MCM-22, MCM-49, zeolite Y, zeolite beta and mordenite, including TEA-mordenite, as transalkylation catalysts. According to the Examiner, it would have been obvious to one having ordinary skill in the art at the time of the invention to have modified the process of Kaufman by utilizing a combination of any two of the transalkylation catalysts disclosed by Cheng because each of these is individually used as transalkylation catalysts. The Examiner further argues i) co-extruding the catalyst as required by present claim 6, would have been obvious given Cheng's disclosure of extrusion as a common method for production of a catalyst, ii) using MCM-56 alkylation catalyst as disclosed by Cheng in transalkylation would have been obvious to one skilled in the art because of MCM-56's "high activity and selectivity for the desired alkylated

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product" and iii) one skilled in the art would have utilized small crystal (less than 0.5 micron) TEA-mordenite inasmuch as Cheng discloses its use as a transalkylation catalyst.

Kaufman teaches the use of zeolites such as faujasite, and zeolites L and Y, in transalkylation of benzene and by-products of benzene alkylation with propylene, but fails to disclose or suggest any of the presently claimed molecular sieves, much less the combinations of MCM-22 type material and zeolite beta or MCM-22 type material and mordenite, for which surprising results have been shown.

The Examiner cites *In re Kerkoven* for the proposition that it would be obvious to combine any two transalkylation catalysts, in any weight percent including those claimed, and that such a combination would be expected to be effective. It is respectfully noted that *In re Kerkoven* addressed a combination of two dried detergent compositions for improving physical flow characteristics, not a combination of two catalysts for reducing byproduct formation in a chemical process. It is further noted that the *Kerkoven* failure to provide data commensurate in scope with the claims was not relative to percentages of components being combined, but rather to the failure to test against the components taught in the prior art.

It has long been established that catalysts are generally considered unpredictable merely from the chemical nature of the catalyst. (*Corona Co. v. Dovan* (USSC 1928) 276 US 358, 369). Catalytic effects are not ordinarily predictable with certainty. *In re Doumani et al.* (CCPA 1960) 281 F.2d 215, 126 USPQ 408. Further, the effect of the modification of one prior art catalytic process in a manner employed in another prior art process which employs a different catalyst was held unpredictable. (*Ex parte Berger et al.*, (POBA 1952) 108 USPQ 236). To find obviousness, "there must be some reason for the combination other than the hind sight gleaned from the invention itself." *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985). Stated in another way, "[I]t is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." *In re Fritch* 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992).

For this reason, it is respectfully submitted that the decision of *In re Kerkoven* does not apply to the present invention which is a combination of specified catalysts out

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of a multitude of possibilities. Therefore, Applicants respectfully submit that the combination is not *prima facie* obvious.

It is noted that Cheng's description states that a suitable transalkylation catalyst "may be a catalyst comprising a zeolite such as MCM-49, MCM-22, PSH-3, SSZ-25, zeolite X, zeolite Y, zeolite beta, or mordenite." (col. 14, lines 28 to 30, emphasis added) This listing, in combination with the list provided by Kaufman, provides 10 individual selections and 10 factorial possible combinations. The grammatical construction of Cheng's disclosure would teach away from a combination of catalysts. While Cheng does indicate that n-propylbenzene, ethylbenzene, and other impurities should be kept very low, preferably less than 100 to 300 ppm, there is no teaching of the concept of combining two unrelated transalkylation catalysts to achieve such a beneficial result.

In industrial practice, each individual catalyst performs optimally in a different combination of operating conditions, and there would be no motivation to combine catalysts which operate optimally at different conditions. Cheng does not in any way indicate that the catalysts are interchangeable with respect to a given set of operating conditions. Applicants note that the specification at page 2, lines 12 through 14, states that there is "a significant problem in the case of cumene production where existing catalysts have either lacked the desired activity or have resulted in the production of significant quantities of by-products such as ethylbenzene and n-propylbenzene." Accordingly, it is respectfully submitted that one skilled in the art acquainted with Kaufman and Cheng would not be led to the present invention. Moreover, neither of these references teaches nor suggests the unexpected improvements obtained by the combinations of molecular sieves in the process of the invention now claimed. Applicants respectfully reiterate that there is no motivation in either the Kaufman or the Cheng reference to combine specific molecular sieves.

Applicants further note that the data supplied in Table 1 of the present specification for beta, mordenite, and MCM-22 individually show that each catalyst performs differently. Although all accomplish transalkylation, each accomplishes 50% conversion at a different WHSV and with different levels of selectivity and by-product formation. It is respectfully submitted that these differences would indicate to one of

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ordinary skill in the art that the molecular sieves, while performing the same category of reaction, do so in different ways and further that they are not so closely related as to make a combination of any two molecular sieves obvious.

Applicants respectfully submit that there is no *prima facie* case of obviousness, and further that there is no suggestion to combine the teachings of Kaufman et al. with those of Cheng et al. Further, if a *prima facie* case of obviousness has been established, which it has not, then Applicants have rebutted that case with evidence of unexpected results.

In response to Applicants' arguments that the claimed process produces superior and unexpected results given the data provided in the Examples of the specification and in the Declaration by Dr. Jane Cheng, the Examiner argues that the showing made by the experimental data is not commensurate with the scope of the presently claimed invention inasmuch as the "claims are not limited to the data points provided and there is no reason to believe that the limited data provided could be extrapolated to all percentage combinations of the catalysts." It is respectfully submitted that a showing of surprising results should not then be used to limit the scope of the invention to specific data points.

Applicants respectfully submit that the crux of the present invention is not a combination of a given percentage of two catalysts, but the discovery of a surprising benefit from combining the specific catalysts disclosed and claimed. There is nothing in the prior art to suggest that the combination of crystalline molecular sieves having a certain X-ray diffraction pattern with selected other crystalline molecular sieves would yield a synergistic effect on the production of by-products in aromatics transalkylation reactions. The catalyst combinations yielding such an effect have been discovered by Applicants. While certain percentage combinations are preferred, having established the benefits of the combination itself, Applicants respectfully submit that the benefit is not limited to the range established by the data submitted. Applicants further submit that the claims are commensurate with the surprising results shown for the combinations tested.

The data provided by Applicants in Table 1 and in the Declaration by Dr. Cheng indicate that the benefit with respect to a given impurity would be expected to trace a curve separate from the line created by a weighted average of the properties of each

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catalyst individually. For example, the n-propylbenzene selectivity achieved with MCM-22 alone (Example 3) was 0.104%; with TEA-mordenite alone (Example 4), a selectivity of 0.086% was achieved; however, with a 1:1 ratio of the two (Example 5), a selectivity of 0.077% was achieved. The mixture surprisingly gave a selectivity that was not only lower than the weighted average "expected" value of 0.095%, it gave a selectivity to an undesired byproduct that was lower than was achievable using either catalyst alone. Further, Table A of Dr. Cheng's declaration (Example 8) shows that for a 2:1 ratio of MCM-22 to TEA-Mordenite, the n-propylbenzene selectivity was 0.075% as compared to an "expected" weighted average value of 0.098%. There would be no scientific reason for assuming that the benefit was limited to the range tested. Rather the two data points for the mixtures and the two data points for the individual catalysts (endpoints) provide four data points which sufficiently define curves which would indicate that all percentage combinations of the identified catalysts would be expected to yield a benefit.

Minimal experimentation would be required for one of ordinary skill in the art to choose molecular sieve catalyst mixtures from those disclosed by Applicants or the percentages to use in order to optimize with respect to a given by-product at the desired operating conditions. The Examiner is respectfully reminded that the Applicant is not in a situation in which the specification of ranges is required to distinguish from prior art, and should therefore, in the event a combination is found to be *prima facie* obvious, only be required to show that the combination has been tested and found superior to the closest prior art, as would have been required for the appellant to prevail in *In re Kerkhoven*. The closest prior art in this situation is the use of either molecular sieve alone.

It is respectfully noted that there is no teaching in the references cited by the Examiner that would indicate any expectation of superior results from a combination of catalysts. It is again noted that catalysis is an unpredictable art, and therefore there would have been no clear expectation of success with a combination of two different catalysts.

If a person of ordinary skill in the art would have been surprised by applicant's results, then the invention could not have been obvious. "The principle applies most often to the less predictable fields, such as chemistry, where minor changes in a product or process may yield

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substantially different results." *In re Mayne*, 104 F.3d 1339, 1343 (Fed. Cir. 1997), quoting *In re Soni*, 54 F.3d 746, 750, 34 U.S.P.Q.2d 1684, 1687 (Fed. Cir. 1995).

In earlier cases involving chemical inventions, the courts and the Board have held that a showing of unexpected results rebutted a *prima facie* case of obviousness. *See, e.g., In re Hedges*, 783 F.2d 1038, 1041, 228 U.S.P.Q. 685, 687 (Fed. Cir. 1986); *In re May*, 574 F.2d 1082, 1094-95, 197 U.S.P.Q. 601, 611 (C.C.P.A. 1978); *In re Orfeo*, 440 F.2d 439, 442, 169 U.S.P.Q. 487, 489 (C.C.P.A. 1971); *Ex parte Ebata*, 19 U.S.P.Q.2d 1952, 1956 (Bd. Pat. App. & Int. 1991).

In this case Applicants have provided objective evidence of unexpected results, and the Examiner has shown no basis for concluding that these results would not apply to the full range of the invention disclosed and claimed. Scientific support for the conclusion of unexpectedness has been provided both in the specification and in the Declaration of Dr. Cheng. As required by *In re Oetiker* 977, F.2d 1443, 24 U.S.P.Q. 1443 (Fed. Cir. 1992); the Applicant has met the burden of preponderance of the evidence to support unexpected results from the invention claimed.

Further it is noted that with respect to enablement, the courts have said:

[T]o provide effective incentives, the claims must adequately protect inventors. To demand that the first to disclose shall limit his claims to what he has found will work or to materials which meet the guidelines specified for "preferred materials" in a process such as the one herein involved would not serve the constitutional purpose of promoting progress in the useful arts.

It is respectfully submitted that this reasoning applies as well to a situation in which the applicant has provided sufficient data to extrapolate the results over the range claimed.

Accordingly, it is respectfully urged that the Examiner reconsider and withdraw this rejection and allow the present claims.


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CONCLUSION

In view of the foregoing comments, entry of this Amendment and allowance of this application is earnestly solicited. Should the Examiner have any further comments or questions, the Examiner is invited to contact the undersigned at the below-listed telephone number.

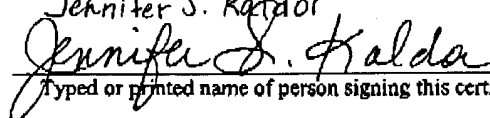
Respectfully submitted,

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